During the last World War, a member of the French Army, Colonel DePage, used a mixture of twenty-four cubic centimeters of ether, five and one half cubic centimeters of ethyl chloride, and one half cubic centimeter of chloroform. This mixture was placed on a gauze-covered cotton pad in a hood made of rubber sheeting. This hood containing the gauze pad saturated with three quarters of an ounce of the above mixture for small or debilitated cases and one and one quarter ounces for large husky individuals, was placed over patient's face and held up in the center to allow room in which to breathe. The theory of this mixture was that the ethyl chloride would evaporate first and produce a rapid loss of consciousness. The chloroform would tide over between the ethyl chloride and ether. By this method induction required approximately two minutes and the anesthesia would last about eight minutes. If the operation was to take longer than eight to ten minutes, the anesthetic was continued under open drop ether. Dr. Guedel used this method in several thousand cases with satisfactory results. Vinyl ether should prove of value used in a similar manner or to replace the ethyl chloride in the above mixture. This same procedure will undoubtedly prove useful in the present war for those cases not in severe shock and for short procedures where a gas machine and oxygen are not available.

IN CONCLUSION

In conclusion I should like to emphasize the importance of adherence to recognized standards of anesthesia;

1. Relieve pain and primary shock with narcotics.
2. Treat the shock present with adequate blood or blood plasma.
3. Empty the stomach of undigested food, if injury has occurred shortly after eating.
4. Use an anesthetic agent and method that will contribute a minimal amount toward shock or preferably aid in reducing it.
5. Maintain a free airway with adequate air or oxygen at all times.

The facilities for anesthesia are extremely limited. However conditions forward do not permit the use of anesthetics to any degree, even if they were available, since the function of the forward portions of the Medical Service with the Division is the evacuation of battle casualties as rapidly as is consistent and practical with the safe transportation of the casualty.

From the Clearing Station on to the General Hospital the availability of anesthetic agents and equipment is quite complete, and trained anesthetists will have the same opportunity for exercising their skill and judgment under military conditions as they had in civilian practice.

Camp Haan.

DEHYDRATED FOOD IN WAR AND PEACE*

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IN discussing the subject of dehydrated foods, their importance in the present war, and their probable importance in the peace that follows, there is no intention of giving the impression that the dehydration of food is a new industry. On the contrary, as you well know, the practice of drying food is centuries old. However, the dehydrated food industry is being revamped to suit modern standards. Our present knowledge of vitamins is sufficient reason for seeking to improve dehydration processes so as to permit maximum retention of these labile elements.

The *Journal of the American Medical Association* for September 12, 1942, contains an article on the "Nutritional Aspects of Feeding an Army," by Colonel Paul E. Howe[1] and in the same issue Captain Ernest W. Brown has discussed the "Nutritional Aspects of Feeding in the United States Navy".[2] Both authors stress the important rôle played by food and its preparation in the maintenance of morale. An adequate diet and its proper preparation aids the maintenance of morale by means other than merely satisfying the appetite in a pleasing manner. An adequate diet implies the proper amounts of the various vitamins, and present knowledge of the mechanism of action of the vitamins provides a real physiological basis for the preservation of morale.

As pointed out by Captain Brown,[2] recognition of the importance of vitamins together with the space limitation in a submarine gives rise to a special dietary problem in this branch of the Navy under war conditions. "These vessels are assigned to patrols which may extend sixty days or over. The storage capacity for provisions is so limited that the protective foods, in the form of fresh fruits and vegetables, eggs and milk, can be carried for only relatively short periods, the personnel then subsisting chiefly on meat and preserved foods, largely of the canned type. There appears to be no doubt as to the adequacy of the caloric and protein aspects of the ration, but there is some question with respect to the sufficiency of vitamin and mineral constituents. The possibility has not been put to the test of a nutrition survey, but all submarine personnel are now supplied with a vitamin complex as a means of forestalling any potential deficiency in these items."

GROWING RECOGNITION OF IMPORTANCE OF VITAMINS

This growing recognition of the importance of vitamins in an adequate diet makes it imperative that we produce a higher quality of dehydrated vegetables than was supplied to the armed forces

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in the last war. A hasty review of the history of vitamins enables us to understand why better dehydrated products could not be supplied in the last war. We need not trace this historical development from the time that the existence of vitamins was first recognized and then recount the successive discoveries of the various vitamins, a process which is still incomplete. Instead, it will suffice to briefly point to a few dates and names associated with the purification, isolation, and identification of A, B_1 and C.

The conversion of carotene to vitamin A was reported by Thomas Moore[3] in 1930. By 1931 Zilva,[4] Bezssonoff,[5] and King[6] and their respective associates had prepared concentrates of C which would protect guinea pigs against the symptoms of C deficiency in dosages of 1 to 2 milligrams daily. In 1932 Waugh and King[7] described the isolation and identification of what was then called "hexuronic acid" and showed that daily doses of 0.5 milligram protected guinea pigs against scurvy. A few weeks later Svirbely and Szent-Gyorgy[8] demonstrated the antiscorbutic activity of "hexuronic acid" isolated from the adrenal gland. Waugh and King[9] then showed that their preparation of "hexuronic acid" and that obtained from adrenals were identical. By 1933 the chemical structure of vitamin C had been established. The chemical structure of thiamin, or B_1, was established after 1935 and was the result of the accumulated evidence of a number of investigators. Our precise knowledge of the other vitamins is of even more recent date. In brief, the purification, isolation and identification of the known vitamins took place during the last twelve years or less.

The significance of this hasty review lies in the fact that exact knowledge regarding the vitamins was necessary before accurate chemical and bioassay methods could be developed for evaluating the vitamin content of various foods. Such methods and the data they yield are prerequisites for the development of dehydrated foods with adequate vitamin retention. Satisfactory foods could not have been prepared during the last war except by chance.

The suggestion may be made that the foods be dehydrated without regard to vitamin retention, and that the vitamins be supplied as a supplement. Such a procedure is objectionable for at least three reasons. In the first place we cannot at present produce enough of the vitamins. Secondly, it remains to be shown that pure vitamins are as effective from a nutritional point of view as a balanced vitamin intake in the natural state. Lastly, as will be shown later, the retention of vitamins in dried foods tends to go hand in hand with the preservation of color and palatability.

Although it is not feasible at present to meet the military and lend-lease requirements with pure or nearly pure vitamin preparations, there has been amazing progress lately in the production of large quantities of vitamins. In a recent U. S. Department of Agriculture Summary under date of October 8, 1942, it was stated that during August alone 155,000 pounds of vitamin A extracted from fish livers was delivered. Deliveries of synthetically produced thiamin hydrochloride amounted to 5,738 pounds and deliveries of ascorbic acid totaled 9,330 pounds. The ability to produce synthetically nearly 3 tons of thiamin is a remarkable achievement when one remembers that its chemical structure was estbalished in the last seven years.

VITAMIN CONTENT OF FOOD SHOULD BE PRESERVED

Even if we can supply at least some of the vitamins by the ton there is much to be said in favor of preserving the vitamin content of our food. It is not wise to satisfy our carbohydrate requirements with candy and pure sugar and thereby decrease our desire for the natural carbohydrate foods which supply needed vitamins and minerals. It is equally unwise to take our daily vitamin requirements in pill form and forego the vitamin-rich foods which supply other elements needed in our adequate diet. The use of pure vitamins belongs more logically to the relief of deficiency states and special emergency situations such as the Navy encounters in feeding submarine crews. Undoubtedly there are vitamins concerning which we know little or nothing, and we are most likely to acquire them through the medium of an adequate diet. Certainly they are not to be found in pill and elixir form.

Allow me to stress the advantage of food as a source of vitamins by reporting recent discoveries concerned with ascorbic acid. This vitamin occurs in certain foods in at least three forms. It occurs as free ascorbic acid, as dehydroascorbic acid, and as protein-combined ascorbic acid. All three of these forms are available to the living organism because the dehydroascorbic acid can be reduced by the body, and the protein-combined material can be hydrolyzed in the digestive tract. Eating food containing vitamin C in these three forms is more apt to maintain a favorable level of ascorbic acid in the tissues and body fluids than is the ingestion of the pure crystalline product. The latter is more susceptible to rapid absorption, giving rise to a relatively rapid increase in blood ascorbic acid followed by excretion in the urine.

It is therefore a matter of economy and common sense to supply the vitamins in naturals form insofar as possible. But meeting the vitamin requirements of our own armed forces and those of our military and civilian allies is only one of the pressing food problems we are facing. Meeting the vitamin requirements means an adequate and varied diet. The global aspects of the present war mean that this food must be shipped to a wide variety of climates at great distances. We are at once faced with the problems arising from a shortage of shipping space, and the need for a reduction of refrigeration to a minimum.

ON PRODUCTION OF HIGH GRADE DEHYDRATED FOODS

The production of high grade dehydrated foods in which the vitamins are preserved contributes much to the solution of these problems. One shipload of dehydrated food is approximately the equivalent of six ship-loads of fresh foods, assuming equal ship tonnage. The fact that dehydrated foods do not require elaborate refrigeration reduces the cost of suitable ship construction and increases the amount of useful shipping space. The production of satisfactory dehydrated foods not only contributes toward the solution of the shipping problem, but also makes feasible the use of otherwise perishable foods in a wide variety of climates. The great reduction in bulk and weight of food should simplify the problems of supply to troops in advanced positions. It is conceivable that supplies could be flown in if necessary.

How do we go about solving the problems met with in producing high grade dehydrated foods? The time allotted will not permit a detailed discussion of the subject. The Bureau of Agricultural Chemistry and Engineering of the Agricultural Research Administration is engaged in an extensive program to improve and further develop the technique of dehydrating foods. The project involves the coöperative efforts of engineers, biochemists, plant physiologists, pharmacologists, agricultural economists, and others. The aim is to produce products with attractive appearance as judged by color, odor, taste and general physical characteristics. Upon reconstitution by the addition of water the products must be palatable and closely resemble or be identical in appearance with the fresh material. Last, but not least, the vitamin content must be preserved to a maximum degree.

The dehydration industry which is developing, and which may continue in peace time if the quality of the products justify such an industry, must not be thought of as an outlet for the utilization of culls, or foods that have been stored awaiting sale. A dehydrated vegetable can be no better than the fresh vegetable from which it is made. A good dehydrated vegetable may be better than a poor fresh vegetable. Not only must a vegetable to be dehydrated be fresh but it must be of the proper variety. The vitamin content of fresh vegetables, to name one variable, may vary considerably from one variety to another. For example, the ascorbic acid content of Savoy cabbage is about four times as great as that of Cannon Ball cabbage. Many vegetables begin to deteriorate as soon as they are harvested. The time between harvesting and dehydrating should be kept to a minimum. The dehydration facilities should be close to the source of supply, so far as the time factor is concerned. In a sense, so far as the labile nutritive elements are concerned, a satisfactory dehydration process may be looked upon as a means of stabilizing the food during the time that elapses between harvesting and its use by the consumer. In fact, despite the vitamin losses which occur during dehydration with present techniques, the vitamin value of the dried product may often be higher than that of the so-called fresh vegetable on the open market.

The normal chemical processes in living plants require the presence of water. The chemical reactions characteristic of deterioration after harvesting are also dependent upon the natural water content. Modern processes of dehydration utilize high temperatures, controlled humidity, forced circulation of air, and, if necessary, reduced pressure. By these means the water content of foods may be reduced to as little as 3 or 5 per cent. Such products deteriorate less rapidly than products dried naturally under influence of sun and wind, conditions which often permit the retention of 25 per cent of the water. Although a low water content greatly slows up the chemical reactions characteristic of deterioration, the dehydrated vegetables will usually develop hay-like odor and taste, and lose color unless precautions are taken to inactivate the enzymes which are believed to facilitate these changes.

Fortunately the relatively simple procedure of scalding inactivates these enzymes in large measure. Scalding may be accomplished by boiling in plain or salt water or subjecting the material to free-flowing steam. The method of scalding and the time of exposure to such treatment for best results must be determined for each type of vegetable. The two samples of carrots exhibited were taken from the same lot of carrots and dehydrated under identical conditions. The sample with good color was steam scalded before dehydration. The colorless and unattractive sample was dehydrated without preliminary scalding.

As will be shown later the retention of color, palatability and vitamins frequently go hand in hand. In our laboratory we have conducted bioassays on the vitamin A values of dehydrated carrots, sweet potatoes, mustard greens and chard. These assays show that little carotene, provitamin A, is destroyed during dehydration. The losses of thiamin and riboflavin during dehydration vary with the different types of vegetables. Losses of thiamin may be as low as 5 per cent or as high as 18 to 20 per cent. Riboflavin losses are minimal in the case of potatoes, but as much as one third may be lost during dehydration of carrots and cabbage. The preservation of ascorbic acid, vitamin C, is one of the most difficult problems encountered in the dehydration of vegetables. With present techniques about one half of the ascorbic acid is lost. Nevertheless, this loss of ascorbic acid is less than the amount that may be lost through deterioration of leafy vegetables in a store under unfavorable conditions.

WHAT IS THE TOTAL VITAMIN CONTENT DELIVERED TO THE CONSUMER?

Under ideal conditions of dehydration a maximum amount of all vitamins will be preserved, but the fundamentally important question is, what is the vitamin content that reaches the consumer? Despite the losses during dehydration the total vitamin content delivered to the consumer in dried vegetables may be as high or higher than in the so-called fresh vegetables that have been in the market several days. As stated before, dehydration may be regarded as a means of stabilizing the vitamin content of vegetables between harvesting and consumption.

If dehydration is to be a means of stabilizing the vitamin content of vegetables, the losses taking place during storage under various conditions must be known. Investigations have been made on the rates of deterioration of the carotene, ascorbic acid, thiamin and riboflavin content of carrots and cabbage stored in air, carbon dioxide and nitrogen, and with different moisture contents, over periods of 16 weeks. In the case of carrots both the thiamin and riboflavin show practically no loss in the presence of 7.0 per cent moisture while stored in air. In the case of cabbage the situation is a bit different during storage in air. The loss in riboflavin is slight and is not appreciably greater in the presence of 10.0 per cent moisture than it is with 3.5 per cent moisture. Under the same conditions thiamin is more susceptible to losses. In the presence of 3.5 per cent moisture there is a loss during the first four weeks, after which the value appears stabilized. But with moisture contents of 8.0 and 10.0 per cent the loss of thiamin is greater and continuous through the storage period. The greater susceptibility to destruction in the case of ascorbic acid is readily shown by the storage tests made on dehydrated cabbage. Storage in oxygen permitted a slightly greater loss in C value than did storage in air when the water content was 3.5 per cent. If the water content was as high as 10 per cent the rate of destruction in oxygen was greater than in air, but in both cases the value at the end of 16 weeks was so low that for practical purposes the value was zero. This instability of ascorbic acid points to the need for a low water content and protection from oxygen. Storage in carbon dioxide and in nitrogen with a water content of 6.5 per cent permitted much better retention of the C value, the results being somewhat better in nitrogen than in carbon dioxide. The preservation of the C value was excellent in nitrogen when the water content was lowered to 4.0 per cent.

The preservation of the vitamins, especially ascorbic acid, in the presence of an inert gas and low water content is, of course, indicative of retarded chemical reactions. The slowing of chemical reaction is also seen in the better preservation of color and palatability with a progressive lowering of the water content, especially when stored in nitrogen.

Doubtless problems remain to be solved, but our present knowledge of the vitamins and the conditions needed to preserve them, as well as the color and palatability, together with the technical facilities to secure a low water content, give a firm foundation to the dehydration industry. It is not likely to collapse when the war ends. For a while, at least, it must not collapse. It will be necessary to assist in the feeding of many nations until they can put their own food production back to work. There will still be a shipping shortage and a need for dehydrated foods, probably an even greater demand. Through the medium of dehydrated foods we have the opportunity to build up a storehouse of otherwise perishable food supplies to be used when the increased demands come.

Remarkable progress has been made in the revamping of the dehydrated food industry to suit modern needs. Continued research may be expected to further improve the products and increase their appeal to the public. There is greater likelihood of a continuation of an active dehydration industry after this war than was the case after the last war. Fresh foods will never be supplanted by dehydrated foods. They have never been supplanted by the enormous canning industry. But, like the canned goods, it does seem likely that high quality dehydrated food will serve a purpose and find an expanding market.

Clay and Webster Streets.

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Association of California Hospitals

Hospital administrators and medical men from throughout California held a meeting in Santa Barbara on April 12 and 13.

The program was opened with greetings by Dr. Clifford W. Mack, president; Mrs. Gladys Smits, superintendent of Cottage hospital and chairman of the local committee on arrangements, and Mayor Patrick J. Maher. Topics discussed during the morning session included tuberculosis, penicillin, the Kenney treatment and "New War Problems Indicating Health Examinations," respective speakers being Dr. Edward Kupka, chief of the state division of tuberculosis; Dr. Paul M. Hamilton, chief of the Los Angeles General hospital division of communicable diseases; Dr. E. D. Barnett, of Sonoma County Hospital; Dr. H. M. Ginsburg, of Fresno County Hospital, and Dr. George M. Uhl, Los Angeles City Health Officer.

Luncheon meetings were followed by an afternoon session, "Economic Aspects of Future Hospital Care," discussed by Dr. E. Vincent Askey. Annual meeting of the Hospital Service of Southern California followed.

A banquet was held in the evening, at which Dr. B. W. Black, medical director of Alameda County institutions spoke on "The Pan-American Hospital Institute in Mexico City," and George Bugbee, executive secretary of the American Hospital association, discussed "The Expanding Program of the American Hospital Association."

Election of officers, trustees and representatives preceded a luncheon meeting at which Dr. Walter L. Halverson, director of the state department of public health, lead discussion on "Rules and Regulations Governing Maternity Homes and Hospitals."